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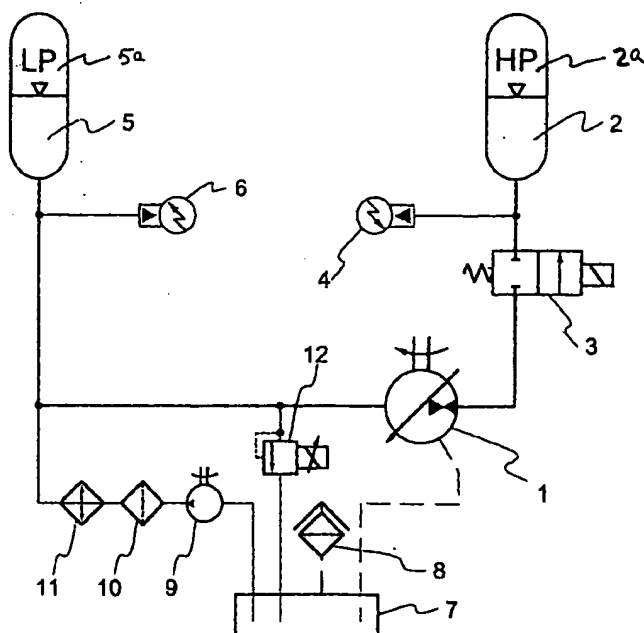
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[Continued on next page]

(54) Title: HYDRAULIC ENERGY STORAGE SYSTEMS



(57) Abstract: A hydraulic energy storage system for vehicles to provide higher efficiency, smaller package size, lower weight, unitary construction, durability and enhanced reliability while maintaining the capability to efficiently store and restore energy at high power levels.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

PCT/IB 01/02785

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B60K6/12 B60T1/10 F16D61/00 F15B1/02 F15B21/14

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B60K B60T F15B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 42 12 542 A (HUBER KURT) 21 October 1993 (1993-10-21) the whole document ---	1,2, 11-14
A	US 2 721 446 A (BUMB RICHARD C) 25 October 1955 (1955-10-25) cited in the application the whole document ---	1,2,11
A	US 5 579 640 A (GRAY JR CHARLES L ET AL) 3 December 1996 (1996-12-03) the whole document --- -/--	1,2

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents:

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"Z" document member of the same patent family

Date of the actual completion of the international search

9 September 2002

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# INTERNATIONAL SEARCH REPORT

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>PATENT ABSTRACTS OF JAPAN  vol. 1995, no. 05,  30 June 1995 (1995-06-30)  &amp; JP 07 032992 A (MITSUBISHI MOTORS CORP),  3 February 1995 (1995-02-03)  abstract</p> <p>-----</p>	1,2

# INTERNATIONAL SEARCH REPORT

PCT/IB 01/02785

## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1, 2, 11-14

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1,2,11-14

Hydraulic energy storage system with high pressure accumulator, a pump/motor and two low pressure accumulators. The claim 11 drafted as compensated accumulator is also seen as a system.

2. Claims: 3,15-24

Compensated accumulator with coaxial high and low pressure chambers having pistons connected by at least three rods

3. Claims: 4-7

Compensated accumulator with coaxial high and low pressure chambers having piston position sensors

4. Claims: 8-10,25

Compensated accumulator with coaxial high and low pressure chambers having connected pistons and integrally formed with a valve block

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

II International Application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 4212542	A	21-10-1993	NONE	
US 2721446	A	25-10-1955	NONE	
US 5579640	A	03-12-1996	AU 5636696 A CA 2219147 A EP 0826112 A WO 9634213 A	18-11-1996 31-10-1996 04-03-1998 31-10-1996
JP 07032992	A	03-02-1995	NONE	

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